

Directive

9180.52 5-1-97

INSPECTION OF MUSTARD SEED

1. PURPOSE

This directive establishes uniform procedures for the factor analysis of mustard seed under the Agricultural Marketing Act of 1946, as amended (AMA).

2. This directive supersedes FGIS Program Directive 918.52, dated 1-28-92. This directive is updated to reflect organizational changes, new numbering system, and new format but does not revise policy.

3. GENERAL INFORMATION

There are no classes, subclasses, or grades in mustard seed.

The inspection of mustard seed is on a factor only basis. The factors analyzed are: kind of grain, infestation, heating, odor, animal filth, glass, unknown foreign substances, garlic bulblets, moisture, dockage, conspicuous admixture, buckwheat, other weed seed, other material, yellow mustard seed, brown mustard seed, Oriental mustard seed, wild mustard seed, cow cockle, stones, ergot, Sclerotinia sclerotiorum (sclerotinia), inconspicuous admixture, damaged kernels (total), heat-damaged kernels, and distinctly green kernels.

The AMA regulations provide for three inspection service levels: original, appeal, and Board appeal.

- a. Appeals. Official personnel shall perform only one appeal inspection on any original inspection service. An applicant may request an appeal inspection on any of the kinds of inspection services performed for an original inspection. For appeal inspections, the field office must analyze the sample for all of the quality factors included in the original inspection.

- b. Board Appeal. An applicant who is dissatisfied with the original or appeal inspection results may appeal to the FGIS Board of Appeals and Review (BAR). The Board appeal shall be limited to an analysis of the file sample. When a request for a Board appeal inspection is filed, the file sample(s) and all other pertinent information shall be immediately submitted to the BAR. The field office shall act as a liaison between the BAR and the applicant.

4. PERCENTAGES

Except for stones and ergot, state all percentages in whole and tenth percent to the nearest tenth percent. State the percentages of stones and ergot to the nearest hundredth percent.

Percentages on the basis of count shall be calculated by dividing the number of unsound kernels by the total number of seeds in the portion and multiplying by 100.

Percentages shall be rounded in accordance with the FGIS procedures.

5. STANDARD ABBREVIATIONS

Use the following abbreviations in the analysis of mustard seed:

Mustard seed	ms	Heating	htg
Conspicuous admixture	cadm	Sclerotinia	slt
Damaged kernels (total)	dkt	Ergot	erg
Distinctly green kernels	dgk	Other material	om
Dockage	dkg	Animal filth	anfl
Heat-damaged kernels	ht	Broken glass	glas
Inconspicuous admixture	iadm	Unknown foreign substance	fsub
Infestation	inf	Other weed seed	ows
Moisture	m	Garlic bulblets	garb
Odor	odor	Buckwheat	bw
Musty	must	Yellow mustard seed	yms
Sour	sour	Brown mustard seed	bms
Commercially objectionable		Oriental mustard seed	oms
foreign odor	cofo	Wild mustard seed	wms
Stones	ston	Cow cockle	cc

6. BASIS OF DETERMINATION

How factors are determined:

Table No. 1 - Basis of Determination

Before Removal of Dockage	After Removal of Dockage	After Removal of Dockage and Conspicuous Admixture
Animal filth Dockage Garlic bulblets Glass Infestation Kind of grain Moisture Odor Unknown foreign substances	Brown mustard seed Buckwheat Conspicuous admixture Ergot Odor Other material Other weed seed Oriental mustard seed Sclerotinia Stones Yellow mustard seed	Damaged kernels (total) Heat-damaged kernels Distinctly green kernels Inconspicuous admixture Odor Wild mustard seed Cow cockle

7. DEFINITION OF MUSTARD SEED

Mustard seed (*Brassica hirta* and *B. juncea*) shall consist of 50.0 percent or more of whole mustard seed before the removal of dockage. The term mustard seed shall not include wild mustard seed.

Whole kernels are kernels with more than three-fourths of the kernel present.

Basis of Determination. Normally, a visual appraisal of the sample is sufficient to determine if it meets the definition of mustard seed. However, if analysis is necessary, make the determination before the removal of dockage on a portion of approximately 25 grams.

8. INFESTATION

Infestation refers to mustard seed that is infested with live weevils or other live insects injurious to stored grain according to procedures prescribed in FGIS instructions.

The presence of any live weevil or other live insect injurious to stored grain indicates the probability of infestation and warns that the mustard seed must be carefully examined to determine if it is infested. In such cases, examine the work sample and the file sample before reaching a conclusion as to whether or not the mustard seed is infested. Do not examine the file sample if the work portion is insect free.

Live weevils shall include rice weevils, granary weevils, cowpea weevils, maize weevils, and lesser grain borers. Other live insects injurious to stored grain shall include grain beetles, grain moths, vetch bruchids, and larvae. (See Grain Inspection Handbook, Chapter 1, General Information, Section 1.2, Visual Grading Aids.)

Basis of Determination. Determine infestation on the lot as a whole and/or the sample as a whole (approximately 500 grams). For specific guidelines, see table No. 2 and Grain Inspection Handbook, Book I, Grain Sampling.

Table No. 2 - Insect Infestation

<p><i>Samples meeting or exceeding any one of these tolerances are infested: 2 lw, or 1 lw + 5 oli, or 10 oli</i></p>	
I. 1,000-Gram Representative Sample <u>1</u> / (+ file sample if needed)	<ul style="list-style-type: none"> - Submitted Samples - Probed Lots - D/T Sampled Landcarriers
II. Lot as a Whole (Stationary)	<ul style="list-style-type: none"> - Probed Lots (at time of sampling)
III. Online Sample (In-Motion) <u>2</u> /	<ul style="list-style-type: none"> - Railcars Under Cu-Sum - Subsamples for Sacked Grain Lots - Components for Bargelots <u>3</u>/ - Components for Shiplots <u>3</u>/
<p><u>1</u>/ Examine work portion and file sample if necessary. Do not examine file sample if work portion is insect free. <u>2</u>/ Minimum sampling rate is 500 grams per 2,000 bushels. <u>3</u>/ Minimum component size is 10,000 bushels.</p> <p>Key: lw = live weevil oli = other live insects injurious to stored grain</p>	

Certification. When applicable, record the word “infested” on the work record and the certificate.

9. HEATING

Seed developing a high temperature from excessive respiration is considered heating. Heating seed in its final states usually produces a sour or musty odor. Care should be taken not to confuse seed that is heating with seed that is warm and moist because of storage in bins, railcars, or other containers during hot weather.

Basis of Determination. Determine heating on evidence obtained at the time of sampling.

Certification. When heating is detected, note on the pan ticket and certificate.

10. ODOR

Basis of Determination. Determine odor on evidence obtained at the time of sampling, on the sample either before or after the removal of dockage, or on the crushed strips (used to determine heat damage and distinctly green damage). When the crushed strips are used, determine the odor immediately after crushing. Odors detected at the time of sampling must be recorded on the work record.

Table No. 3 - Odor Classification Examples

Sour	Musty	Commercially Objectionable Foreign Odors
Boot Fermenting Insect (acid) Pigpen Smoke *	Ground Insect Moldy	Animal hides Decaying animal and vegetable matter Fertilizer Fumigant Insecticide Oil products Skunk Smoke (evidence of fire- burnt material) Strong weed
* Consider smoke odors as sour unless there is evidence of fire-burnt material.		

Odors From Heat-Damaged Mustard Seed. When heat-damaged kernels are present, mustard seed gives off an odor very similar to smoke. Mustard seed containing a “smoke” odor is considered as having a “sour” odor unless evidence of a fire-burnt material is present in the lot or the original sample. If evidence of a fire-burnt material is present in the lot or the sample, the smoke odor is considered a commercially objectionable foreign odor.

Commercially Objectionable Foreign Odors. Commercially objectionable foreign odors are odors that are entirely foreign to mustard seed that render it unfit for normal commercial usage.

Fumigant or insecticide odors are considered commercially objectionable foreign odors if they linger and do not dissipate. When a sample of mustard seed contains a fumigant or insecticide odor that prevents a determination as to whether any other odor(s) exists, apply the following guidelines:

- a. Original Inspections. Allow the work portion to aerate in an open container for a period not to exceed 4 hours.
- b. Appeal, and Board Appeal Inspections. Allow unworked file samples and new samples to aerate in an open container for a period not to exceed 4 hours. Do not aerate file samples (worked files) which were previously aerated and retained as the final file.

Consider the sample as having a commercially objectionable foreign odor if the fumigant or insecticide odor persists based on the above criteria.

Certification. If present, record the words “Musty,” “Sour,” or “Commercially Objectionable Foreign Odor” on the work record and the certificate.

11. ANIMAL FILTH, GLASS, AND UNKNOWN FOREIGN SUBSTANCES

Basis of Determination. Determine animal filth, glass, and unknown foreign substances on the basis of the sample as a whole (approximately 500 grams).

Certification. Record the number of pieces of animal filth, glass, and unknown foreign substances on the work record and the certificate.

12. GARLIC BULBLETS

Basis of Determination. Determine the number of garlic bulblets on the sample as a whole (approximately 500 grams).

Three dry or partly dry garlic bulblets are equal to one green bulblet (refer to Interpretive Line Slide Nos. OF-13.0 and OF-13.1).

Certification. Record the number of garlic bulblets on the work record and the certificate.

13. MOISTURE

Moisture is the water content of mustard seed as determined by an approved device in accordance with procedures prescribed in the Grain Inspection Handbook and Equipment Handbook.

Basis of Determination. Determine moisture on **exactly** 250 grams cut from the original sample.

Certification. Record the percentage of moisture on the work record and the certificate to the nearest tenth percent.

14. DOCKAGE

Dockage is material, other than mustard seed, that can be easily removed with sieves and/or a cleaning device. Also, underdeveloped, shriveled, and small pieces of mustard seed that cannot be recovered by properly rescreening or recleaning.

Basis of Determination. Determine dockage in mustard seed on a representative portion of approximately 250 grams cut from the original sample.

Procedure. The procedure for determining dockage is performed in 2 steps: machine cleaning and handsieving.

NOTE: Mustard seed contains a high oil content and may gum sieves and other equipment. Care should be taken to clean all equipment. Mild soapy water and/or Alconox lab detergent have been found to be effective for cleaning the equipment.

STEP 1. Procedure for Determining Dockage with the Carter Dockage Tester.

- a. When running samples through the Carter Dockage Tester, insert the appropriate sieves and riddles, and set the air and feed controls to the proper position. Note that the Carter Dockage Tester must be at zero energy anytime sieves are inserted or removed.

	<u>Air</u>	<u>Feed</u>	<u>Riddle</u>	<u>Top</u>	<u>Middle</u>	<u>Bottom</u>
Mustard seed	5	3	000	10	11	---

- b. Run the portion through the Carter Dockage Tester.
- c. Dockage is all material removed by aspiration, material that passed over the riddle (except threshed and sprouted kernels of mustard seed, material that passed over the No. 10 sieve, and material that passed through the No. 11 sieve.

NOTE: Return kernels of mustard seed that may be caught in the riddle to the cleaned portion.

STEP 2. Procedure for Determining Dockage with Slotted Sieves (Reclaiming).

- a. Seed passing through the No. 10 sieve but over the No. 11 sieve must be sieved with a stacked series of sieves with an approved mechanical shaker. ^{1/}

The size sieves used in the stacking series depends on the type and the size of the mustard seed. The following sieve combinations can be used the majority of the time:

Type	Top	Bottom
Yellow	7/64" or 8/64" round	1/14" or 1/15" round
Oriental	1/12" (5.5/64") round	1/24" x 1/2" slotted
Brown	113" (5/64") round	1/24" x 1/2" slotted

Inspectors, however, should use the combination of sieves which achieves the maximum cleanout of dockage. The above-listed sieve combinations are only suggestions. An inspector, for example, may determine that the suggested combination for one type of mustard seed may be appropriate for another type of mustard seed.

Indicate sieve sizes used on the work record and certificate.

- b. Mount the appropriate sieves and a bottom pan on an approved mechanical shaker.

^{1/} If an approved mechanical shaker is unavailable, inspectors may hand sieve the sample. When handsieving, hold the sieve level in both hands with elbows close to the sides. In a steady motion, move the sieve from left to right approximately 10 inches and then return from right to left. Repeat this motion 30 times.

- c. Set the count stroker at 30 and pour the material which passed through the No. 10 sieve but over the No. 11 sieve on the appropriate top reclaiming sieve and turn on the shaker.
- d. Return material to the appropriate portion. Material remaining on the top sieve and passing through the bottom sieve is dockage. Seed that passes through the top sieve but remains over the bottom sieve is considered as mechanically cleaned seed.

Computing Dockage. In computing the dockage, all mechanically separated dockage (as removed by the Carter Dockage Tester and hand sieves) shall be computed on the basis of the sample as a whole.

Proceed as follows:

(Weight of Dockage ÷ original sample weight) x 100 = percent mechanically separated dockage.

Example:

Original sample weight	250 grams
Weight of mechanically separated dockage	24.70 grams

24.70 grams ÷ 250 grams = 0.099 x 100 = 9.90% dockage

Certification. Show the percentage of dockage on the work record and certificate to the nearest tenth percent.

15. STONES, ERGOT, AND SCLEROTINIA

Stones are concreted earthy or mineral matter and other substances of similar hardness that do not disintegrate readily in water.

Ergot is a hard, reddish-brown or black grain-like mass of certain parasitic fungi that replaces the kernels of certain grains. When determining for the presence of ergot, refer to Interpretive Line Slide No. OF-12.0.

Sclerotinia are the dark-colored or black resting bodies of the fungi Sclerotinia and Claviceps. When determining for the presence of sclerotinia, refer to Interpretive Line Slide No. OF-32.0.

Basis of Determination/Procedure. Determine stones, ergot, and sclerotinia by handpicking a representative portion of approximately 250 grams cut from the dockage-free portion.

Certification. Show stones and ergot on the work record and certificate to the nearest hundredth percent. Show sclerotinia to the nearest tenth percent.

16. CONSPICUOUS ADMIXTURE

Conspicuous admixture is all matter other than mustard seed which is conspicuous and readily distinguishable from mustard seed and which remains in the sample after the removal of dockage.

Basis of Determination. The determination for conspicuous admixture (buckwheat, other weed seed, and other material) shall be made on a representative portion of not less than 10 grams cut from the work sample after the removal of dockage.

Procedure for Determining Conspicuous Admixture by Handpicking.

STEP 1. Cut down the mechanically cleaned sample to a portion of approximately 10 grams.

STEP 2. Handpick the 10-gram portion for conspicuous admixture (buckwheat, other weed seed, and other material) which is readily distinguishable by visual inspection.

NOTE: Buckwheat (*Fagopyrum esculentum*) shall include both buckwheat and wild buckwheat.

STEP 3. Calculate the percentage of each factor.

To compute conspicuous admixture, add the weight of buckwheat, other weed seed, and other material.

$0.10 \text{ grams} \div 10.24 \text{ grams} = 0.0097 \times 100 = 0.97\% \text{ buckwheat}$

$0.02 \text{ grams} \div 10.24 \text{ grams} = 0.0019 \times 100 = 0.19\% \text{ other weed seed}$

$0.01 \text{ grams} \div 10.24 \text{ grams} = 0.0009 \times 100 = 0.09\% \text{ other material}$

$(0.10 + 0.02 + 0.01) \div 10.24 \text{ grams} = 0.0126 \times 100 = 1.26\%$ conspicuous admixture
(add in hundredths and certify in tenths)

Certification. Show the percentages of conspicuous admixture, buckwheat (including wild buckwheat), and other weed seed on the work record and certificate to the nearest tenth percent.

17. PURITY

Yellow mustard seed (*Brassica hirta*).

Color: light, creamy yellow to yellow; occasionally, a seedcoat is light or yellowish-brown.
Size: large, 2 to 3 mm in diameter.
Shape: spherical but occasionally oval (rounder than brown or Oriental mustard seed).
Surface: texture is similar to an orange peel or a grapefruit; white hilum.

Brown mustard seed (*Brassica juncea*).

Color: reddish to dark-brown.
Size: small, less than 2 mm in diameter.
Shape: oval.
Surface: predominate netting; texture is similar to a golf ball; black hilum.

Oriental mustard seed (*Brassica juncea*).

Color: predominantly yellow to dark-yellow, with from 3 percent to 10 percent ranging from light-brown to brown.
Size: small, less than 2 mm in diameter.
Shape: oval.
Surface: fine netting which is not nearly as predominant as for brown mustard seed; light-brown to dark-brown hilum

Basis of Determination/Procedure. Determine the percentages of yellow, brown, and Oriental mustard seed by the color of the seedcoat on a portion of approximately 10 grams after the removal of dockage

Certification. Show the percentage of yellow, brown, and Oriental mustard seed to the nearest tenth percent on the work record and certificate.

18. DAMAGED KERNELS

Damage must be distinct. In general, a kernel of mustard seed shall be considered damaged when the damage is distinctly apparent and of such character as to be recognized as damaged for commercial purposes.

- a. Damaged Mustard Seed. Kernels and pieces of kernels of mustard seed which are heat-damaged, sprout-damaged, mold-damaged, distinctly green, frost-damage, rime-damaged, or otherwise materially damaged.
- b. Heat-Damaged Kernels. Kernels and pieces of kernels of the mustard seed which, after being crushed, are materially discolored and damaged by heat.
- c. Distinctly Green Kernels. Kernels and pieces of kernels of the mustard seed which, after being crushed, are a distinct green throughout the kernel.

Basis of Determination. The determination for damaged kernels shall be made on a representative portion cut from the work sample after the removal of dockage and conspicuous admixture. Use the portion which was used for picking conspicuous admixture. Note that this portion must be reweighed.

Procedure. The steps for determining the various damages are as follows:

STEP 1. Handpick the 10-gram portion (clean of dockage and conspicuous admixture) for distinctly shrunken or shriveled kernels (frost damage), kernels discolored by mold, rimed kernels (kernels that are completely covered with a whitish coloration), sprouted kernels, excessively weathered kernels, and any other kernels of mustard seed that are distinctly damaged.

These kernels are other-damaged kernels (refer to Interpretive Line Slides).

STEP 2. Cut down the balance of the 10-gram portion to approximately 5 grams.

STEP 3. Sprinkle the 5-gram portion across the damage seed counter to fill the 100-hole board (must be repeated five times) or the 500-hole board.

STEP 4. After each filling (total of 5 fillings when using the 100-hole board) and before crushing, tape and observe for inconspicuous admixture. 1/

STEP 5. With a roller, crush the mustard seed, examine the rows, and count the number of heat-damaged kernels, distinctly green kernels, and seeds that are obviously not mustard seed (inconspicuous admixture).

STEP 6. After the strip (all 5 strips when using the 100-hole board) has been crushed and kernels counted, calculate the percentage of each type of damage.

All percentages of damage, except for distinctly green and heat-damaged kernels, shall be determined upon the basis of weight. The percentage of distinctly green and heat-damaged kernels shall be determined on the basis of count.

To compute damaged kernels (total), add the percentage of distinctly green, heat-damaged, and other-damaged kernels of mustard seed.

Proceed as follows:

- a. $(\text{Weight of other-damaged kernels} \div \text{weight of representative portion}) \times 100 =$
percent other-damaged kernels.
- b. $500 - \text{number of non-mustard seed kernels} = \text{number of mustard seed kernels}.$
- c. $(\text{Number of heat-damaged kernels} \div \text{number of mustard seed kernels}) \times 100 =$
percent heat-damaged kernels.
- d. $(\text{Number of distinctly green kernels} \div \text{number of mustard seed kernels}) \times 100 =$
percent distinctly green kernels.
- e. $\text{Percent other-damaged kernels} + \text{percent heat-damaged kernels} + \text{percent}$
 $\text{distinctly green kernels} = \text{percent damaged kernels (total)}.$

Example:

Weight of representative portion		10.11g
Weight of other-damaged kernels		0.10g
Number of non-mustard seed kernels	10	
Number of heat-damaged kernels		25
Number of distinctly green kernels		12

1/ Refer to section 19 for details.

- a. $0.10\text{grams} \div 10.11\text{grams} = 0.0099 \times 100 = 0.99\%$ other-damaged kernels.
- b. $500 - 10 = 490$ mustard seed kernels.
- c. $25 \text{ kernels} \div 490 \text{ kernels} = 0.0510 \times 100 = 5.10\%$ heat-damaged kernels.
- d. $12 \text{ kernels} \div 490 \text{ kernels} = 0.0244 \times 100 = 2.44\%$ distinctly green kernels.
- e. $0.98\% + 5.10\% + 2.44\% = 8.52\%$ percent damaged kernels (add in hundredths and round to 8.5%).

Certification. Show the percentages of heat-damaged, distinctly green, and damaged kernels (total) on the work record and certificate to the nearest tenth percent.

19. INCONSPICUOUS ADMIXTURE

Inconspicuous admixture is any seed which is difficult to distinguish from mustard seed. Examples of inconspicuous admixture include but are not limited to rapeseed, canola, wild mustard seed, and cow cockle.

Wild mustard seed.

Color: varying shades of black to light reddish-brown.
Size: small.
Shape: uniformly round or spherical compared to the irregular shape of rapeseed.
Surface: at a magnification of 40/80 power, the reticulations appear thick and float with very small interspaces and stipples.

NOTE: Wild mustard seed does not have a longitudinal crease with a ridge on the center of the kernel.

Cow Cockle.

Color: black.
Size: about the same size as wild mustard seed.
Shape: not as round as wild mustard seed.
Surface: very bumpy.

NOTE: After crushing, cow cockle tends to be white.

Basis of Determination. Make the determination for inconspicuous admixture on the 5-gram portion used in the determination for heat-damaged and distinctly green kernels (refer to section 18, Steps 3 - 5).

Prior to crushing, mark any seeds suspected of not being mustard seed and observe with a dissecting scope or magnifying glass. Use the reference samples as an aid in identification.

NOTE: It is extremely important for inspectors to rely on a dissecting scope or a magnifying glass and the crushed strips for identification of inconspicuous admixture.

Note that all electrical units must have a seal of approval from Underwriters Laboratory (U/L) or a similar testing laboratory.

Any seeds suspected of not being mustard seed should be marked to be confirmed after crushing.

Calculate the percentage of inconspicuous admixture on the basis of count.

Example:

$10 \text{ kernels} \div 500 \text{ kernels} = 0.02 \times 100 = 2.0\% \text{ inconspicuous admixture.}$

Certification. Show the percentage of inconspicuous admixture on the work record and the certificate to the nearest tenth percent. 1/

1/ Inspectors may be requested to certify the percentage of wild mustard seed and cow cockle. If requested, show the percentages of these factors on the work record and certificate to the nearest tenth percent.

20. CERTIFICATION

The analysis of mustard seed shall be certified on a commodity inspection certificate. A **lot inspection certificate** must be issued for those lots that are officially sampled. A **submitted sample certificate** must be issued for a sample submitted by an applicant or an agent.

A mustard seed analysis shall be shown on a commodity inspection certificate in the following order:

- | | | |
|----------------------------------|---------------------------|--------------------------------|
| 1. Infestation | 9. Dockage | 17. Brown mustard seed |
| 2. Heating | 10. Stones | 18. Oriental mustard seed |
| 3. Odor | 11. Ergot | 19. Wild mustard seed |
| 4. Animal filth | 12. Sclerotinia | 20. Cow cockle |
| 5. Glass | 13. Conspicuous admixture | 21. Damaged kernels (total) |
| 6. Unknown foreign
substances | 14. Buckwheat | 22. Heat-damaged kernels |
| 7. Garlic bulblets | 15. Other weed seed | 23. Distinctly green kernels |
| 8. Moisture | 16. Yellow mustard seed | 24. Inconspicuous
admixture |

When an applicant requests analysis for only specific factors record the following sentence on the certificate:

“Specific factor analysis only.”

David Orr, Acting Director
Field Management Division